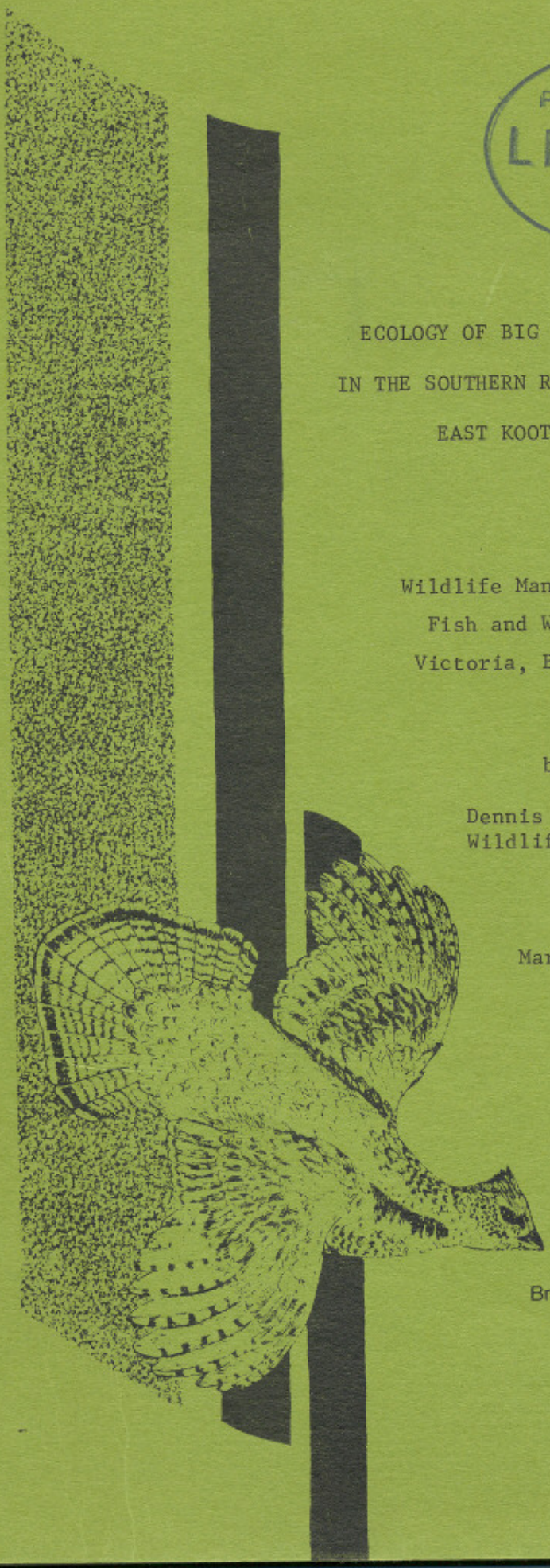
ECOLOGY OF BIG GAME WINTER RANGES IN THE SOUTHERN ROCKY MOUNTAIN TRENCH, EAST KOOTENAY REGION

Wildlife Management Division
Fish and Wildlife Branch
Victoria, British Columbia

by

Dennis A. Demarchi
Wildlife Biologist

March, 1971



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INTRODUCTION

Wildlife populations of the north temperate regions have two critical seasons; one, the season of winter storms, and two, the breeding season (Leopold, 1933, p.126). Leopold states that, the practical problem of game-range management, therefore, may be approached and examined from this standpoint of critical seasons.

The big game ranges in the East Kootenay are no exception; here the most critical ranges are the winter ranges. Documentation of the value of the winter ranges has been studies by Sugden (1953), W. G. Smith (1955, 1957 and 1959), D. A. Demarchi (1966 and 1967-69), R. A. Demarchi, I. D. Smith and Eastman (1969), Bandy (1968), Eastman (1968 and 1970), R. A. Demarchi and I. D. Smith (1969), Quaedvlieg (1969) Bustard (1970) and Kemper (1970). These were studies of specific winter range problems or identification of the overall problem. The case of documentation of the need for winter ranges in the East Kootenay was finally cumulated into a statement from the Canada Land Inventory report edited by W. A. Benson (1970) "The most outstanding characteristic of the East Kootenay is its capability to support large populations of big game. In this regard, the region is unique in North America and ranks highly on a global scale."

Along with the identification of critical game range has been the realization that these same areas are in jeopardy. If present land use practices continue, this valuable

resource will suffer drastically. Land alienation, (agricultural and urbanization), overgrazing and reforestation have all been considered as being unfavourable to the perpetuation of big game species by the direct loss of the winter range in the Rocky Mountain Trench.

The objectives of the study were to:

1) Determine the amount of existing winter range in the Rocky Mountain Trench by examing the various plant communties;

2) Determine the range condition of each winter range;

3) Determine the amount of potential winter range that has been reforested since 1920; and

4) To outline areas where livestock reductions must be undertaken in order to preserve the existing wildlife populations and, to mitigate for wildlife losses that will be suffered with the flooding of the Libby Reservoir as outlined by . I. D. Smith (1970).

THE STUDY AREA

This study was conducted in the East Kootenay region of British Columbia. Specifically, the study area was the Rocky Mountain Trench from the Canada - U. S. A. border north to Templeton River near Briscoe (Figure 1). The lateral limits of the study area were approximately the 3,700 ft elevation contour line on the Rocky Mountains and the Purcell Mountains. South of Cranbrook the study area extended to the north shore of Moyie Lake.

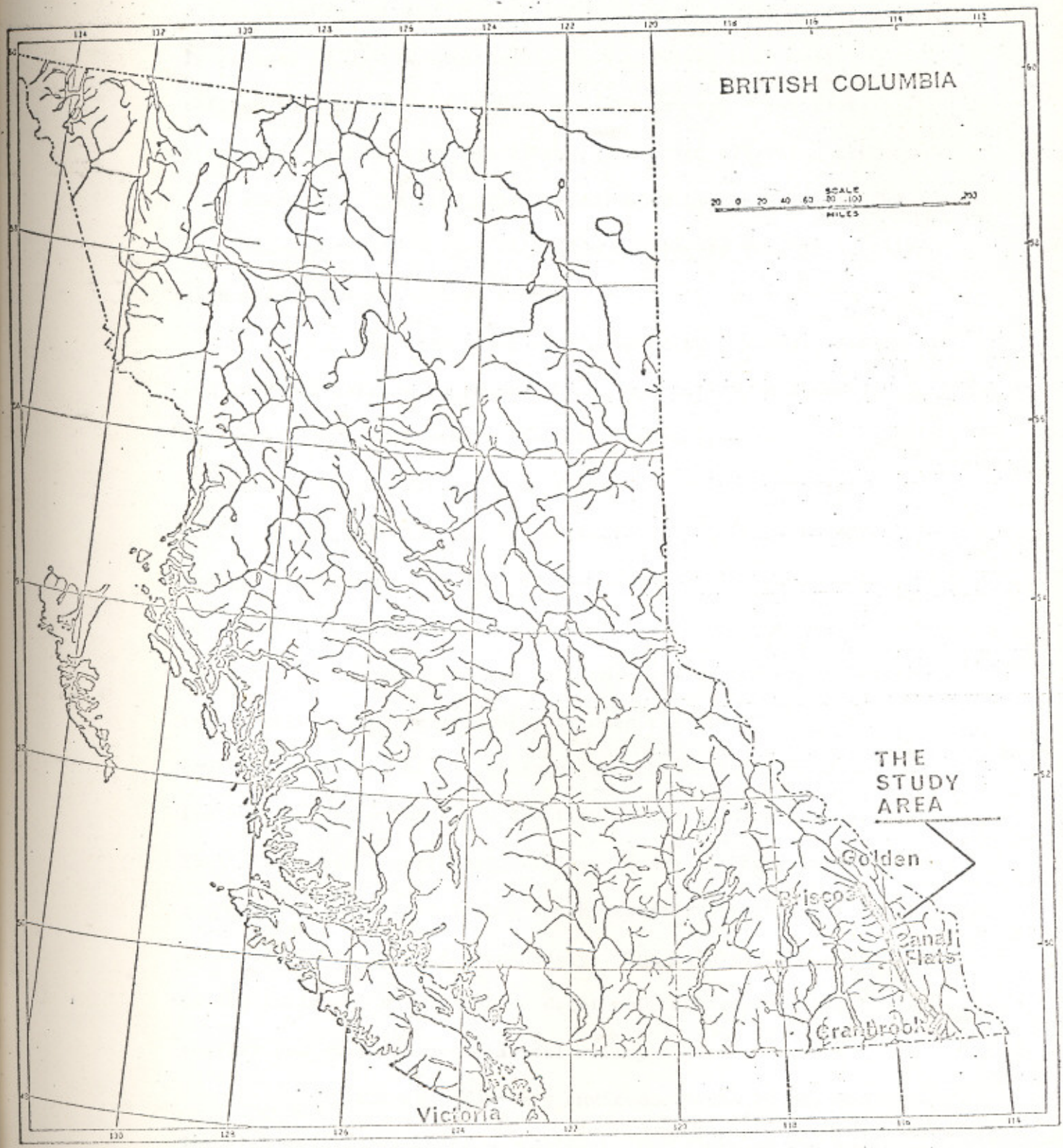

Figure 1. The study area.

Description of the East Kootenay Region

The following description is paraphrased from a report by Wright and Jungen (1966). The East Kootenay region is an area of upland continental-type climate, with well defined seasons of cold winters and dry summers. The landscape are youthful with the latest glaciation effecting all land surfaces. The landscape is dominated by steep, dissected and folded mountain ranges with wide ice-carved valleys infilled with many kinds of glacial debris.

The land forms are occupied by youthful soils and the soil pattern expresses a high measure of uniformity. Any diversity in the soil pattern can be related to: (a) differences in the mineral composition of the parent soil materials; or (b) differences in the local moisture conditions and the accompanying changes in the nature of the plant cover; or (c) local differences in the stability of the land forms.

Changes in the soil moisture regime within the region result from an interplay between the strong north-south alignment of major landforms and the oblique impact of the northwest-southwest ebb and flow of the major air masses. Thus sites with a north-easterly aspect are markedly cooler and moister than those with a south-westerly aspect and soil formation is influenced accordingly. The main valleys open to the south and have a rather drier moisture regime than the shorter east-west aligned lateral valleys.

The East Kootenay environment can be divided into two major soil moisture regimes. The floor of the Rocky Mountain Trench and the lower valley sides as far north as Briscoe has a subhygrous moisture regime. The Rocky Mountain

Trench north of Briscoe, as well as most of the mountain ranges rising above the Trench as far south as the U. S. border have a hygrous moisture regime. The various moisture regimes are often indistinct and local aspect often modifies the general moisture regimes of an area.

The climatic and topographic factors that affect the soil moisture regime also determine the nature of plant cover. Open coniferous forests with a well-developed ground cover of perennial grasses is dominant throughout the subhygrous moisture zone, while the forests become more dense and lose their grass cover in the hygrous zone. There is a complete range of ecological types from grassland prairies, through park-like coniferous forest with small patches of open grassland, to dense coniferous forest without any ground cover or with a ground cover dominated by heath plants. The vegetation pattern represents accidents of history (fires, occupancy by men, grazing pressure of livestock, big game, etc.), but the main patterns are undoubtedly related to the major moisture regimes.

METHODS

Aerial photographs and forest cover maps for the Rocky Mountain Trench from Briscoe south to the Canada-U. S. A. border were studied intensively before field work commenced and were used for constant reference throughout the study. Plant community boundaries were accepted as being the boundaries established by the Forest Service as outlined on their forest cover maps. Site classifications were noted on the forest cover maps to aid in the classification of non-forest communities.

One hundred forty sites were examined using a plotless method of site index. Each plant species at each site was given a value based on its percent canopy coverage with index values based on values established by Daubenmire (1959 and 1968). These index values were based on a rating of 1 - 6 (Table 1).

Table 1. Values for a coverage estimation technique (Daubenmire, 1968 pg. 43)

COVERAGE CLASS	RANGE OF COVERAGE, %	MIDPOINT OF COVERAGE CLASS, %
1	0 - 5	2.5
2	5 - 25	15.0
3	25 - 50	37.5
4	50 - 75	62.5
5	75 - 95	85.0
6	95 - 100	97.5

Classification of the various plant communities were based on 25 macroplots and 25 paired line transects established throughout the East Kootenay in 1966 by myself and Don Eastman. In that study, the macroplot technique of Poulton and Tisdale (1961) was used with the following modifications: the plots were 15 by 30 m instead of 30 by 100 ft. Four randomly selected, parallel 15 m transects were located in each. At one and one-half m intervals along each transect, a tenth sq m frame was employed to determine the canopy-coverage according to the method of Daubenmire (1959 and 1968).

The paired, parallel line transects were 10 m and 5 m apart. The tenth sq m frame was located every half m and the data was analyzed as above.

Additional data was collected during the 1970 survey, to aid in the classification of the grazing potential of each site. This information was: the amount of browsing on all shrub species, the general distribution of the grass species with relation to the shrubs and the amount of carry-over on all plant species. This information was then classified on a basis of I, II or III. Class I condition reflected excellent condition, preferred browse and herbaceous plant species being present with excellent carry-over. Class II condition reflected a plant community that was over-browsed or over-grazed, there being very little carry-over, however, preferred browse and herbaceous plants were still abundant, although weedy species were very dominant. Class III condition reflected severe over-grazing and over-browsing, with

very little carry-over and a marked elimination of desirable plant species which were replaced by undesirable species.

It was understood that livestock and big game did not necessarily have similar forage preferences. However, the complexity of big game species and their foraging habits justified the condition rating into the three classes. In the East Kootenay, elk, white-tailed deer, and mule deer were the major forage consumers, however, several ranges also had bighorn sheep and moose. With this wide diversity of animal species, most perennial herbaceous and shrubby plants were considered as ideal forage at some time of the year. Livestock (cattle and horses) only tended to "fill out" a nearly complete foraging "picture" in the East Kootenay.

Finally, the Forest Service inventory maps were used as the basis for ageing the forests into year classes i.e. 0 - 20 years, 20 - 40 years, and 40 years plus. One complication arose because there were four major dates of inventories: 1963, 1964, 1965 and 1968. Therefore, depending on the completion date of the inventory, the forests could be up to seven years older than classified. For the purpose of this study, conifer forests were classified mainly by age groups rather than dominant species.

Area figures for each classified type on each map, and compartment were obtained from the Forest Inventory Division. Where compartments were changed, a randomized dot grid of 100 dots per sq in was used to calculate the area involved.

RESULTS AND DISCUSSIONS

Krajina (1969) indicated two biogeographical zones for the southern Rocky Mountain Trench, that of the yellow pine-bunchgrass zone and the Interior Douglas-fir zone. However, there were also several small areas that were best described as mesic bunchgrass and the xeric bunchgrass zones in the sense of Tisdale (1947). The former occurred on the Tobacco Plains, St. Mary Prairie and Skookumchuk Prairie. The latter occurred from Columbia Lake to Steamboat Mountain. McLean and Holland (1958) described the latter grasslands as being in the mesic bunchgrass zone, however, the presence of rabbitbrush and pasture sage indicated xeric habitat type.

Brayshaw (1965) outlined the concept of primary succession and climax in the dry forests of southern British Columbia (Table 2). It was held that this concept was representative of the forest types in the present study. However, there was on possible exception in that there was also a Douglas-fir/bitterbrush[1]. sub-association which succeeds to the yellow pine/bunchgrass climatic climax.

Of primary concern in this present study were the yellow pine/bitterbrush; yellow pine/bunchgrass; and, Douglas-fir/bunchgrass associations with their related sub-associations.

The history of forest fires in the East Kootenay suggested that for the most part, the entire Rocky Mountain Trench was in some state of succession and that very few

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1. See Appendix A for a list of scientific and common names of all plants species mentioned in the text.

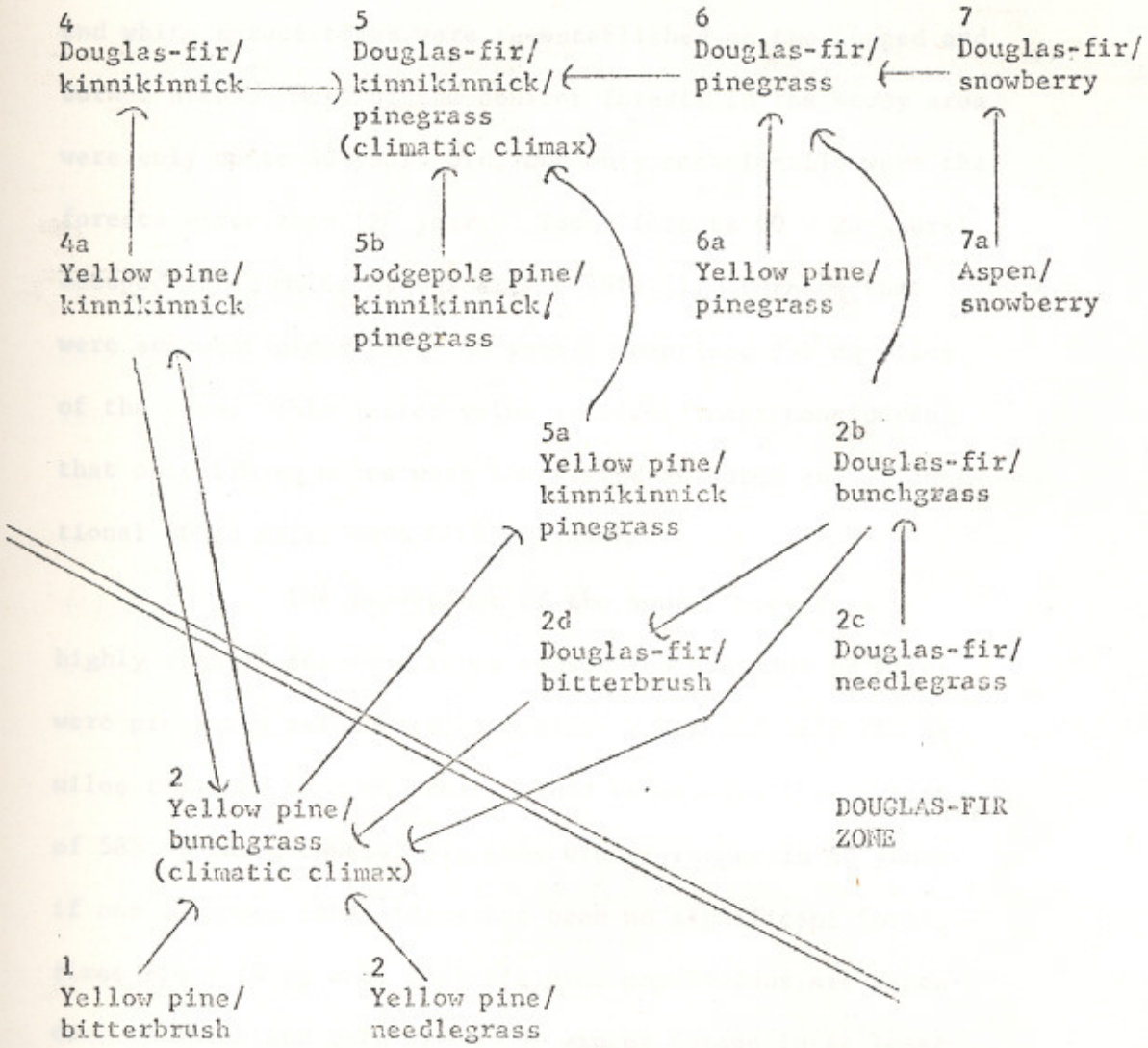
climatic climax forests existed. Most of the succession involved forest-type sub-associations. However, there existed substantial area of seral-shrub sub-associations which represent at the main concern of wildlife managers and the livestock industry.

The seral shrub association was found to be complex due to the variability of the relief, parent soil material and the original forest associations. Also, some areas were repeatedly burned and there was disproportionate grazing and browsing given to some seral shrub associations by both livestock and big game. In some instances, succession proceeded towards a climatic climax and in others retrogression occurred because of the intensity of ungulate use given a particular seral-shrub association or area. Finally, succession on some sites was slowed so there was very little change in the seral shrub association over several years.

Certainly, all situations existed in the study area. Thus the trend of succession was not always easy to determine. In fact, in such a short term project, it was unwise to imply a trend. Therefore, Brayshaw's (1965) basic forest habitat types were adopted with the inclusions as noted above.

Thus, this study did not attempt to satisfy any "academic" ecological needs and treated all seral-shrub communities equally without regard for climatic climax or successional trend.

Table 2. Primary and Secondary Relationships in the yellow pine and Douglas-fir zones. (Adapted from Brayshaw, 1965 p. 73)



FOREST REGENERATION

Conifer forests consisting mainly of yellow pine, Douglas-fir, and lodgepole pine, but also, some larch and white spruce trees were re-established on the logged and burned areas. Most of the conifer forests in the study area were only up to 80 years old, and only occasionally were the forests older than 120 years. Young forests (0 - 20 years) occuped 46 sq miles of the area (Table 3). Forests that were somewhat older (20 - 40 years) comprised 255 sq miles of the area. This latter value is significant considering that only 170 sq miles were classified as burns and an additional 46 sq miles were native grassland.

The importance of the young forests is highly significant when it is considered that 301 sq miles were presently reforested by conifer trees and only 217 sq miles remained as open areas. This represents a reduction of 58% of the potential big game winter ranges in 40 years if one assumes: that there has been no significant forest fires since 1930; and, that big game populations are dependent on burns and open areas for winter forage in at least the critical winters.

These assumptions become valid when one considers: that the last major forest fires occurred in 1931; that, the winter distribution of big game is restricted by availability of nutritious forage in critical winters; and that the abundance of shrub, grass and forb species is greatest in seral or burned stands and markedly reduced in forest stands. This

Table 3. Total square miles of grasslands, seral-shrublands and conifer forest regeneration in the southern Rocky Mountain Trench

Unit Area Description	Native Grass-land	Seral-Shrub-lands	Regenerating Forests 0-20 Years	Regenerating Forests 20-40 Years
Tobacco Plains - Elk River	6.1	20.0	0.9	20.6
Newgate - Plumbob Creek	1.1	24.9	7.9	32.3
Baynes Lake - Wigwam River-Jaffray	-	22.8	3.9	16.7
Sand Creek - Bull River	0.2	29.4	3.1	28.1
Plumbob Creek - Mayook	0.2	5.5	3.8	12.8
Bull River - Wildhorse River	0.7	2.1	0.2	5.9
Mayook - St. Mary River	2.6	3.5	0.4	1.8
Peavine Creek - Perry Creek	0.4	5.4	2.3	10.4
Wildhorse River - Hebert Creek	1.2	1.4	0.2	1.0
St. Mary Prairie	10.6	5.3	1.1	3.0
Lewis Creek - Lussier Creek	2.9	9.9	1.5	8.0
Mathew Creek - Skookumchuck Creek	3.7	5.2	4.7	23.2
Lussier River - Canal Flats	-	4.8	3.2	20.4
Skookumchuk Creek - Finlay Creek	0.5	7.7	3.9	17.8
Finlay Creek - Dutch Creek	2.6	13.5	3.4	29.7
Columbia Lake East	1.7	0.1	-	0.1
Fairmont - Forster Creek	10.8	1.2	2.5	8.4
Forster Creek - Templeton River - Briscoe	0.6	7.7	3.6	14.4
Subtotals - Tobacco Plains-Dutch Creek	33.3	161.4	40.5	231.5
Templeton River - Columbia Lake E.	13.1	9.0	6.1	22.9
TOTALS	46.4	170.4	46.6	254.6

latter statement is substantiated by studies made by Kemper (1970) on Premier Ridge.

Almost every compartment in the area had representatives of the four major forest types (burns, young, intermediate and old forests). The age class distribution of the forests indicated that tree regeneration was dynamic and thus the burned-over areas were being reforested. Comparisons made between a map of the East Kootenays in 1913 and the current forest inventory reveal that there has been dramatic shifts in the location of merchantable timber stands. (Figure 2 and Appendix c). Therefore, it can be expected that with the present fire protection system the burns will become smaller in size. Unless existing forests are burned, or forest regeneration is stopped, there will be a slow but complete elimination of the burns and thus the seral-shrub areas from the study area.

The present forest fire prevention and elimination programme in the area appears to be extremely effective in that most of the forest regeneration was by trees that started growing in the period of 1930 - 1950. There was very little regeneration in the period of 1950 - 1970. This indicates that prior to this period, a non-effective forest fire control programme was in effect and extensive areas were burned. However, since then, there have been very few large fires. Forest regeneration has been allowed to encroach into the burned-over areas.

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Baynes Lake - Wigwam River-Jaffray	-	22.8	3.9	16.7
Sand Creek - Bull River	0.2	29.4	3.1	28.1
Plumbob Creek - Mayook	0.2	5.5	3.8	12.8
Bull River - Wildhorse River	0.7	2.1	0.2	5.9
Mayook - St. Mary River	2.6	3.5	0.4	1.8
Peavine Creek - Perry Creek	0.4	5.4	2.3	10.4
Wildhorse River - Hebert Creek	1.2	1.4	0.2	1.0
St. Mary Prairie	10.6	5.3	1.1	3.0
Lewis Creek - Lussier Creek	2.9	9.9	1.5	8.0
Mathew Creek - Skookumchuck Creek	3.7	5.2	4.7	23.2
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Skookumchuk Creek - Finlay Creek	0.5	7.7	3.9	17.8
Finlay Creek - Dutch Creek	2.6	13.5	3.4	29.7
Columbia Lake East	1.7	0.1	-	0.1
Fairmont - Forster Creek	10.8	1.2	2.5	8.4
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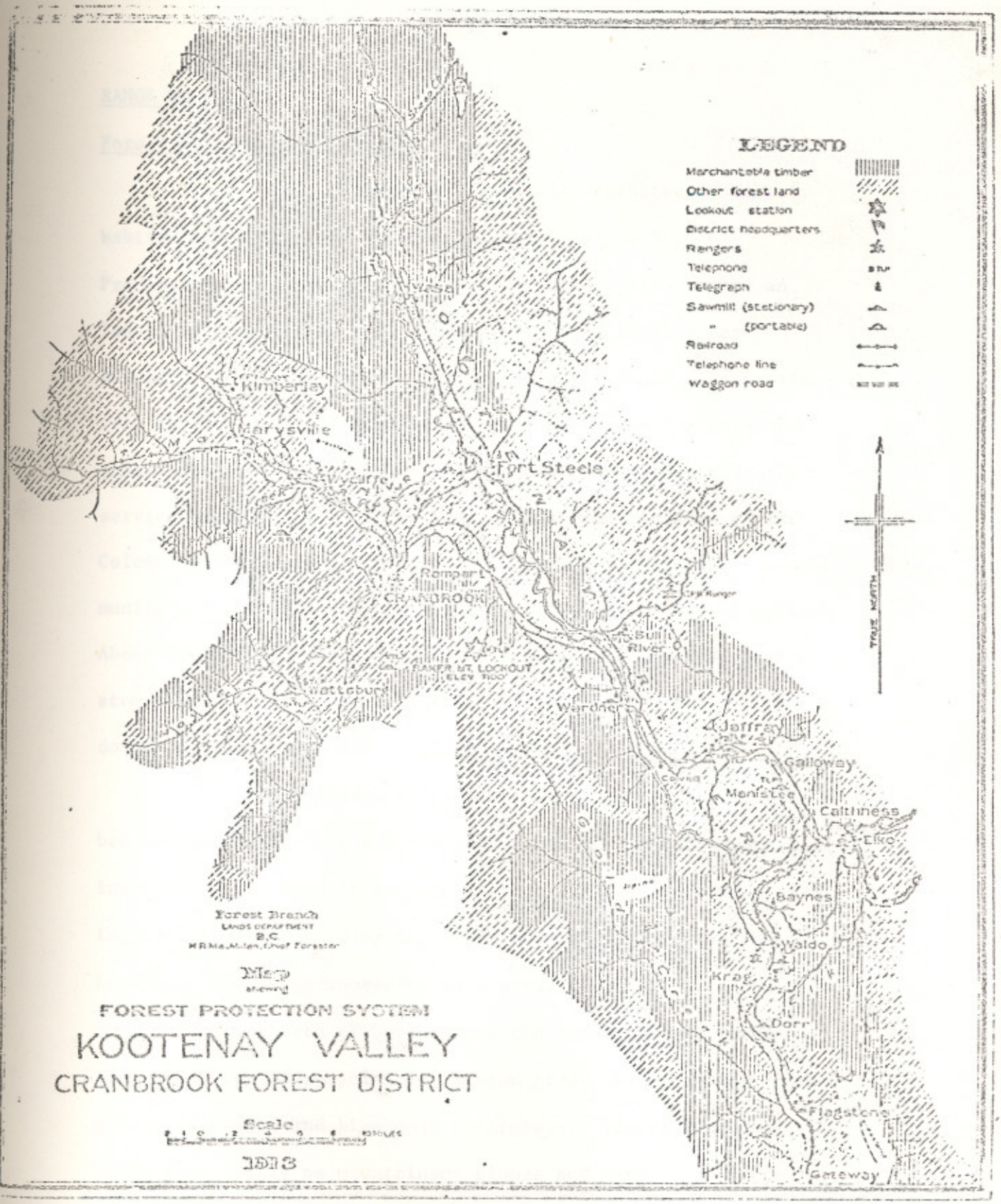

FIGURE 2. Forest Cover in the Cranbrook and Elko map sheet areas.

RANGE CONDITION

Forest Fire Seral Shrublands

Most of the study area was dominated by forest habitat types (Table 3 and Photographs 1, 2 and 3).[2.3.] Predominant were the yellow pine and Douglas-fir zones or an integrade between the two. When the lowland forests were burned, a shrubby seral community resulted. South of approximately the 50° parallel of latitude, and at elevations less than approximately 3700 ft the dominating plants were bitterbrush, serviceberry, flat-topped spiraea, Richardson needlegrass and Columbia needlegrass. There were a few areas where this community did not occur; Wigwam Flats was the most noted exception. Above 3700 ft or north of the 50° parallel of latitude, yellowstem ceanothus, redstem ceanothus and soapolallie became the dominating shrubs in the seral conditions.

Complexities resulted throughout the study area because two basic forest zones were involved, including their intergrades and even intergrades with the grassland zones, also, logging, repeated burning the various levels of grazing and browsing were superimposed on each area.

North of Dutch Creek the seral-shrub communities consisted of soapolallie, Oregon grape, kinnikinnick, pinegrass, stoneseed and bluebunch wheatgrass. The seral-shrub areas were mostly on mountainous slopes and were

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2. See Appendix B for all photographs referred to in the text.

3. See Appendix C for cover-type maps referred to in the text.

given a condition class rating of I (Table 4).

South of Dutch Creek to Torrent two shrub communities were observed. One community consisted of soapolallie, serviceberry, bluebunch wheatgrass, kinnikinnick and Junegrass. The other community included Canada bluegrass, Kentucky bluegrass and pinegrass (Photograph 4). The former community was given a condition class rating of I, while the latter community was given a condition class rating of II. These two shrub communities were also present above 3700 ft elevation on the slopes of the Rocky and Purcell Mountains as well as on Premier Ridge, Perry Creek, Moyie Valley, Pickering Hills, Twin Lakes and Sheep Mountain; however, here yellowstem ceanothus was also abundant in both communities.

South of Canal Flats (below 3700 ft elevation) bitterbrush was the dominant species in the seral-shrublands. Associated species were serviceberry, kinnikinnick, snowberry, Oregon grape, soapolallie, Columbia needlegrass, Richardson needlegrass, Kentucky bluegrass, bluebunch wheatgrass, pink pussytoes, Filago arvense, cheatgrass, downy chess, fleabane, wild sweet William, golden aster, and giant mullein (Photographs 5, 6, 7, and 8). All of these species were commonly present in any one area. However, this was mainly due to the protection that bitterbrush afforded other plants when grazing did not eliminate the bush itself. In effect, overgrazing caused a microhabitat separation into undershrub and intershrub areas. The intershrub areas were often completely overgrazed and yet under the bitterbrush

Table 4. Condition classes of all grassland and seral-shrub ranges in the Southern Rocky Mountain Trench in 1970 (In square miles)

	Range Condition Classes			Total
	GOOD I	FAIR II	POOR III	
Seral Shrub Range				
N	8.9	-	-	8.9
S	24.5	34.0	102.8	161.3
Grassland Range				
N	-	1.7	11.5	13.2
S	-	-	33.2	33.2
Total	33.4	35.7	147.5	216.6

N = Columbia Lake (East) - Templeton River

S = Tobacco Plains - Dutch Creek

67% IN POOR CONDITION

there was abundant grass and shrub production. In this protected habitat the forage was unavailable though to wildlife and livestock unless they could reduce the protective bitterbrush cover. Therefore such communities were given a condition class rating of III.

The only units where a sizeable proportion of the intershrub area was dominated by Columbia needlegrass, Richardson needlegrass, and serviceberry were from Tobacco Plains to the Elk River and from the Lussier River to Canal Flats. One other area of exception was a limited area on Crowsnest Industry lands west of the Elk River at Elko. These areas were given condition class ratings of II.

The one area south of Canal Flats and below 3700 ft elevation that did not have a bitterbrush dominated seral-shrub community was Wigwam Flats. The seral shrub communities in this area were indicative of a higher elevation and were reflecting soils of a different parent material. There were four seral-shrub communities on this range which were: redstem ceanothus, serviceberry, and Canada bluegrass; soapolallie, kinnikinnick, Canada bluegrass and Kentucky bluegrass; rose, pincherry, bluebunch wheatgrass and horsemint; and, oatgrass, wild pink, Oregon grape, kinnikinnick and showberry. The former three communities were given condition class ratings of I, while the latter community was rated II.

Very few timbered communities were examined in the study; most of them appeared in excellent condition (condition class I) with little variation from unit to unit.

However, the understory community varied markedly from the seral-shrub stages. The understory community consisted of kinnikinnick, Oregon grape, snowberry, and pinegrass with some soapolallie. The one noted exception that was not a reflection of soil type, was in the Wildhorse River-Norbury Lake area. There, pinegrass and Oregon grape were virtually non-existent and the community was dominated by kinnikinnick, and pink pussytoes and if rated would have been given a condition class of III.

Grasslands

Almost all the grasslands were in a severely retrogressed state (Table 4), even though many of them had indications of being reseeded in the past. Much of this evidence was assumed to relate to the range reseeding program conducted in 1966 by the Forest Service.

The xeric bunchgrass habitat type was represented by a community dominated by pasture sage, pink pussytoes, Junegrass, Sandberg bluegrass, common needle-and-thread grass and rabbitbrush (Photographs 9 and 10). This community was present from Steamboat Mountain south to Dutch Creek with a great degree of uniformity except that rabbitbrush was more abundant on more protected sites and bluebunch wheatgrass was prevalent in only isolated localities. Thus, the grasslands in this region were given a condition class rating of III.

On the east side of Columbia Lake, the same grassland community was present, however, rabbitbrush and bluebunch wheatgrass were more abundant. Also present in

that area was a mesic grassland community dominated by Kentucky bluegrass, Canada bluegrass, Junegrass, pink pussytoes and pasture sage that occurred along the northern (shadow) edges of the forests. The grasslands of this unit were given a condition class rating of II.

Grasslands from Canal Flats northward, that occurred on the slopes of the Rocky and Purcell Mountains were in better condition than those on the lowlands. However, there were so few grasslands in that situation that they were all given the condition rating of the unit that they were in.

South of the confluence of the Lussier and Kootenay Rivers the grasslands were more mesic and lacked the presence of the shrubby grassland species (rabbitbrush and pasture sage) except in isolated areas. The dominant community consisted of Junegrass, pink pussytoes, plantain, and Sandburg bluegrass (Photograh 11). Cheatgrass and downy chess were dominant in some areas, and needle-and-thread grass was dominant on Tobacco Plains. Bluebunch wheatgrass, rough fescue and Idaho fescue have all but been eliminated throughout, except in relict areas (Photograph 12).

All the southern grasslands were given a condition class rating of III, possible exceptions were some of the needle-and-thread grass areas of the Tobacco Plains Indian Reserve which almost warranted being in condition class II. The restricted size of this type and additional weedy nature of the plant community justified it being rated as class III.

CONCLUSIONS

The seral-shrub areas that form the critical big game winter ranges in the Rocky Mountain Trench were formed by forest fires in the early 1900's. These areas are now being reinvaded by conifer trees due to the present forest fire protection program. Reforestation that has occurred since 1930 now occupies 301 sq miles, while only 170 sq miles remain as seral-shrub areas (critical big game winter range). This same big game winter range is also overgrazed to the extent that 103 out of 170 sq miles are classified as critically overutilized. Thus only 57 sq miles of seral-shrub areas remain in good condition and presently unforested. The limited grassland ranges of the area, though not capable of the same degree of reforestation, are seriously overgrazed. Forty-four sq miles are classified as class III condition and only 2 sq miles are in class II condition.

It was understood that livestock and big game did not necessarily have similar forage preferences. However, the complexity of big game species and their foraging habits justified rating the condition of the range into three classes. In the East Kootenay, livestock only "fills out" a nearly complete foraging "picture".

Finally, 28.1 sq miles of grassland, seral-shrub, conifer and deciduous forests and riparian habitat will be inundated when the Libby Reservoir is flooded in 1972.

RECOMMENDATIONS

In order to mitigate wildlife losses that will be caused by the flooding of the Libby Reservoir, it is vital that livestock reductions be undertaken on all Rocky Mountain Trench grasslands and seral-shrub areas that are in class II and III condition.

Stock reduction recommendations have already been presented to the Grazing Division, the Libby Reservoir Progress Committee and the Land Use Committee. These will best be accommodated as a result of range purchases in the Libby Reservoir Area (I. D. Smith, 1970). Specifically, the recommendations at that time were:-

"There are two alternative methods of achieving such mitigation:

1) By purchase of land and associated grazing rights on 18,000 acres of prime winter range; or

2) By retiring grazing quotas of range properties purchased by the Department of Highways in connection with Libby flooding.

"It is estimated that 1,000 to 1,500 cows should be retired from the range to mitigate the wild ungulate losses.

"If the second alternative is taken, it has the advantage of providing a means of mitigation with no additional capital costs beyond those required to compensate flooded landowners. Since these costs are to be paid in any case, it would mean that mitigation for wildlife could be accomplished at virtually no cost (other than the cost of grazing fees, which are

low in any case and are often offset by costs of range improvement, fencing of highways and other projects associated with the maintenance of cattle on the range.)"

Further to the stock reductions that should occur in the Libby Basin, a redistribution of livestock, and a reduction of stocking quotas must be undertaken in all other units in the Rocky Mountain Trench.

Wildlife populations have suffered serious declines in the 1960's due largely to the loss of suitable wintering habitat. Some species like the Rocky Mountain bighorn and elk are at critically low population levels. Further curtailment of hunting will have no effect if there is no winter forage for them.

Considering the potential rate of reforestation, the above mitigating procedures, while vital to the wildlife resource, must only be considered as a first step. An equally important second step must involve retarding forest invasion and reductions of forests on potential big game winter range, especially in the vicinity of the present ranges. Forest cover must be removed over successive blocks of land to add, substantially, to the existing capability of the Rocky Mountain Trench to support big game during the winter.

The methods of forest removal must be established i.e. logging, controlled burns or land clearing with chains and rails. Similarly, the size of the areas must be determined as well as the relationships between forage producing areas and escape cover or nearby timber stands. Finally, the areas on which to concentrate this concern must be studied.

This present study was only able to determine the existing problem areas. Other studies must be consulted to determine potential winter range areas.

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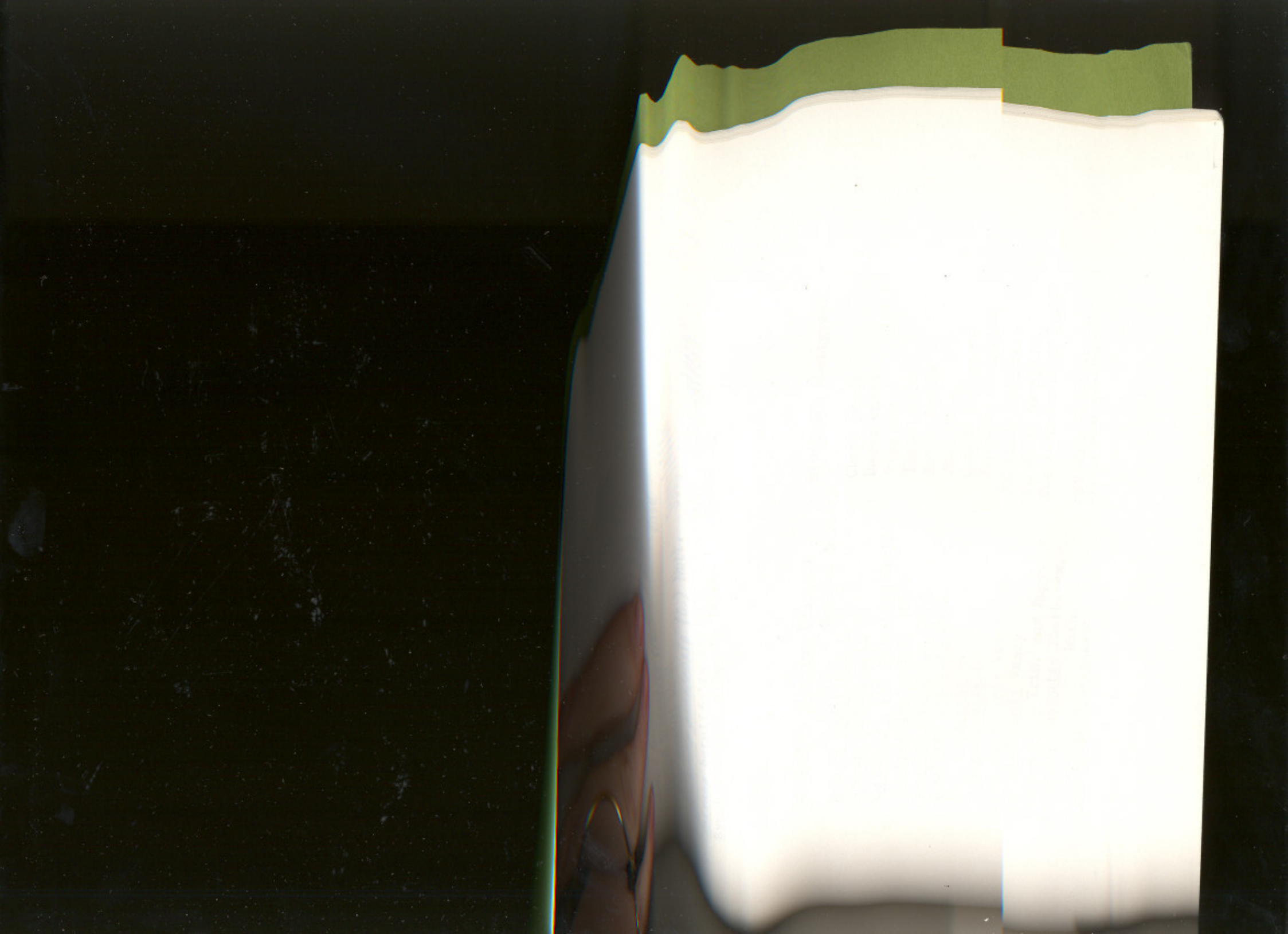

Appendix A Scientific and Common Names and Authorities for Plant Species Mentioned in the Text

TREES:

Larix occidentalis Nutt.	Larch
Pinus contorta Dougl. ex Laud.	Lodgepole pine
Pinus ponderosa Dougl. ex Laud.	Yellow pine
Populus tremuloides Mich.	Aspen
Pseudotsuga menziesii (Mirbel) Franco	Douglas-fir
Picea spp. A.	Spruce

SHRUBS:

Amelanchier alnifolia Nutt.	Serviceberry
Arctostaphylos uva-ursi (L.) Spreng	Kinnikinnick
Artemisia frigida Willd.	Pasture sage
Berberis nervosa Pursh.	Oregon grape
Ceanothus sanguineus Pursh.	Redstem ceanothus
Ceanothus velutinus Dougl. ex Hook	Yellowstem ceanothus
Chrysothamnus nauseosus (Poll.) Britt.	Rabbitbrush
Prunus pensylvanica L.	Pinchberry
Purshia tridentata (Pursh.) D.C.	Bitterbrush
Rosa woodsii Lindl.	Rose
Shepherdia canadensis (L.) Nutt.	Soapolallie
Spiraea betulifolia Pall.	Flat-topped spiraea
Symphoricarpus albus (L.)Blake	Snowberry

GRASSES:

Agropyron spicatum (Pursh.) Scribn. & Smith	Bluebunch wheatgrass
Bromus secalinus L.	Cheat grass
Bromus tectorum L.	Downy chess
Calamagrostis rubescens Buckl.	Pine grass
Festuca idahoensis Elmer	Idaho fescue
Festuca scabrella Torr.	Rough fescue
Koeleria cristata Pers.	June grass
Poa compressa L.	Canada bluegrass
Poa pratensis L.	Kentucky bluegrass
Poa sandbergii Vasey	Sandberg bluegrass
Stipa comata Trin. and Rupr.	Needle-and-thread grass
Stipa occidentalis Thurb. ex Wats.	Columbia needlegrass
Stipa richardsonii Link	Richardson needlegrass

Antennaria rosea Greene	Pink pussytoes
Chrysopsis villosus (Pursh) Nutt. ex. D. C.	Golden aster
Erigeron compositus Pursh.	Fleabane
Erigeron filifolius Nutt.	Fleabane
Filago arvense L.	
Fragaria virginiana Duchesne	Strawberry
Lithospermum ruderale Dougl. ex. Lehm.	Stoneseed
Monarda fistulosa L.	Horsemint
Phlox hoodii Rich.	Wild sweet William
Plantago patagonica Jacq.	Plantain
Verbascum thapsus L.	Giant mullein

APPENDIX B

Photographs referred to

in the text.

SUPPLEMENT FOR REPORT ON:

ECOLOGY OF BIG GAME WINTER RANGES IN THE SOUTHERN ROCKY MOUNTAIN TRENCH, EAST KOOTENAY REGION

Wildlife Management Division
Fish and Wildlife Branch
Victoria, British Columbia

by

Dennis A. Demarchi
Wildlife Biologist

March, 1971

SQUARE MILES OF VARIOUS HABITAT-TYPES WITHIN SEVERAL WILDLIFE CAPABILITY UNITS

HABITAT TYPES	1W	1W+ COMPLEX	2W	2W+ COMPLEX (POORER)	3W	3	3 PLUS COMPLEX POORER	3 PLUS COMPLEX GREATER	TOTAL
T_2	18.0	34.1	41.0	6.9	12.0	6.0	17.2	38.2	136.5
T_1	5.3	6.8	4.5	1.0	2.5	1.0	1.2	3.0	25.3
B_1	17.6	1.1	3.8	-	2.3	-	4.1	1.2	30.1
B_2	3.0	2.5	-	-	-	-	-	5.8	11.3
B_3	25.5	28.7	11.7	9.5	.8	4.2	.2	23.5	104.1
G	2.8	1.9	3.8	.2	5.8	.3	-	12.6	27.4
C	1.2	3.2	11.7	.3	3.2	.3	t	19.7	39.6
River								18.9	18.9
tal Area	141.2	157.3	214.5	47.9	197.4	139.5	438.4	404.8	1741.0

SQUARE MILES OF VARIOUS HABITAT-TYPES WITHIN BIGHORN SHEEP WINTER RANGES IN THE ROCKY MOUNTAIN TRENCH

HEEP ANGES	STODDART CREEK	COLUMBIA LAKE	PREMIER RIDGE	ESTELLA MINE	WILDHORSE RIVER	BULL RIVER	WIGWAM FLATS	PHILLIPS CREEK
bitat types								
T_2	.1	.2	.1	.1	.1	t	.6	-
T_1	-	-	.2	-	-	-	.4	-
B_1	-	-	1.9	t	-	-	4.4	-
B_2	-	-	-	-	-	-	-	t
B_3	-	.3	.8	-	-	4.1	-	-
G	.5	2.2	-	-	-	-	-	-
C	t	-	-	.2	-	t	.1	-
tal Area	5.9	7.0	8.6	3.5	2.8	6.5	18.8	.8

	T_2	T_1	B_1	B_2	B_3	G	C	TOTAL AREA	A.U.M.'S 1969
N-31	-	.04	.04	-	-	-	-	17.36	-
N-107	2.80	.48	-	-	-	-	-	27.08	440
N-125	1.16	.52	.04	-	-	-	-	5.92	116
N-77	4.60	.28	-	-	.20	-	-	22.48	335
N-26	6.12	1.76	-	-	.48	1.76	.64	66.72	3309
N-104	2.76	.88	-	-	.24	.32	.40	25.80	939 + 812
N-111	-	-	-	-	-	.20	.12	1.88	75
N-99	-	-	-	-	-	1.80	.56	32.32	1768
N-116	1.24	.36	-	-	.60	4.12	3.28	63.80	403 + 2013
N-124	.68	-	.16	-		2.48	3.72	38.16	837 + 114
N-79	-	-	-	-	-	-	-	63.24	356
N-112	.04	-	-	-	-	2.68	-	12.36	nil
N-42	11.28	2.24	9.08	1.24	-	1.08	.48	54.48	2000
N-2	1.80	.36	-	-	-	.24	-	13.96	1355
N-3	2.20	-	-	-	-	-	.04	48.28	540
N-41	11.08	.24	-	.24	-	-	.04	44.04	2112
N-108	3.92	.48	-	-	3.68	-	.12	21.72	550
N-123	-	-	-	-	-	-	-	4.72	nil
N-18	18.52	1.88	-	-	9.20	2.72	.92	58.08	1900
N-15	5.08	.72	2.04	-	3.16	.48	.48	25.84	1498
N-16	1.32	.36	.96	-	2.44	1.12	2.04	28.16	1060
N-37	11.08	3.04	-	-	9.52	.08	1.12	49.08	3573
N-4	.08	.60	-	-	2.56	.44	-	10.40	2551
N-1	.84	.16	.24	-	1.20	1.36	1.68	40.32	1860
N-24	3.80	.12	-	-	1.52	.84	2.96	50.44	2111
N-40	-	-	-	-	2.32	2.04	2.16	33.44	2082
N-81	.84	.12	-	-	1.64	.08	.32	10.24	463
N-93	2.48	2.04	.96	-	-	.24	.60	26.32	1106
N-95	2.96	.92	.56	-	t	.16	.76	30.08	83
N-89	.72	-	-	-	-	.36	-	21.00	1304 + 429
N-38	.76		t	-	.48	.04	.40	15.80	832
N-71	-	.16	-	-	2.44	.56	.44	8.72	989

Continued on next page . . C

SQUARE MILES OF VARIOUS HABITAT-TYPES WITHIN GRAZING PERMIT AREAS C
(CONTINUED)

PERMIT AREA	T_2	T_1	B_1	B_2	B_3	G	C	TOTAL AREA	RIVER	A.U.M.'S 1969
N-109	.08	-	-	-	3.44	-	-	4.16		424 + 24
N-88	2.60	-	-	-	-	-	.60	26.80		203 + 198
N-120	.32	-	.04	-	-	-	-	34.96		-
N-34	2.40	.08	-	-	3.36	.04	.32	10.00		1045
N-36	9.60	1.00	.80	-	11.20	-	.36	37.68	1.12	2350 + 58
N-11	4.12	.56	.24	-	.12	-	.52	12.60		196 + 63
N-119	.08	-	-	-	-	-	-	41.24		456
N-25	2.84	-	.16	-	-	2.44	.56	8.72	.44	649 + 20
N-118	1.00	.32	5.12	-	-	-	.04	10.40		200
N-32	14.04	.20	2.48	2.36	14.52	.36	2.08	94.08	7.64	8025
N-22	2.48	.52	-	-	3.00	-	.24	8.96		1447 + 43
N-73	7.52	1.88	-	-	1.28	-	.60	44.56		681 + 210
N-21	14.20	4.52	-	-	13.68	.24	.44	224.20	5.36	9000
N-9	12.16	2.04	-	-	8.92	.60	.72	69.24	2.00	2600
N-6	8.04	.16	1.56	5.56	4.20	5.72	4.40	87.84	5.96	2600
TOTAL	179.64	29.04	24.48	9.40	105.20	34.60	34.16	1687.68	22.52	70407

GRAZING PERMIT DATA

1969 Grazing Permit Summaries and Habitat Data from Forest Inventory Division and Fish and Wildlife Branch

April 1, 1971

East Kootenay 1969 Grazing Permit Allocations

Total A.U.M.'s = 70,407 or
11,734 A.U. - per 6 months (grazing season)
land base = 1687.68 square miles or 1,080,115 acres
which is equal to 15.24 acres per A.U.M. or
.022 square miles per A.U.M.
or 91.44 acres per A.U. - per 6 months or
.132 square miles per A.U. - per 6 months

HABITAT-TYPE*	SYMBOLS ON COVER MAP	SQUARE MILES	ACRES
Non sufficient restock - N.S.R.			
Condition Class I	B_1	24.48	15,667.2
" " II	B_2	9.40	6,016.0
" " III	B_3	105.20	67,328.0
Grassland	G	34.60	22,144.0
Conifer forests - 0-20 yrs. old	T_1	29.04	18,585.6
20-40 yrs. old	T_2	179.64	114,969.6
All other lands (forests over 40 years, rivers, lakes, etc.)	F	1,305.52	835,404.8
Total Area		1,687.68	1,080,115.2

* Private land, highways, railroads and small ponds have not been eliminated from the calculations of area in the habitat-types.

APPENDIX C- Cover-type maps of the Study Area

	Symbol	Colour
Conifer forests: 0 - 20 years old	T1	
20 - 40 years old	T2	
Other forests (Conifer forest 40 years plus, and deciduous forests)	F	
Seral-shrublands (Burned-over forest lands): Condition Class 1 (Preferred browse and herbaceous plants - excellent carry-over)	B_1	
Condition Class 11 (Preferred species present - but overutilized, weedy species dominant)	B_2	
Condition Class 111 (marked elimination of preferred species - even weedy species overutilized)	B_3	
Grasslands	G	
Cultivated fields and urban areas	C	
Water bodies	X	